

## Inclusive Jet Cross Section/MC Comparisons

- Want to use the MC to determine a bin-by-bin correction to the Inclusive Jet  $E_T$  distribution.
- Compared bin-by-bin results to the Run I unfolding
- Use the MC to derive the response function and use an iterative unfolding method.
- Once the technique is verified, determine the cross section measurements for other jet algorithms (MidPoint, KtClus).
- Extend measurements to the forward  $\eta$  region

Ran over the gjt10c, gjt20c, gjt30c, gjt40c datasets that were processed using offline version 5.1.0.

Used DataAccess runMaker compiled with 5.3.0 to produce the ntuples. Redid clustering but did not redo calorimetry.

```
mod talk CalibrationManager
```

```
  ProcessName set PROD_PHYSICS_CDF
```

```
  PassName set 11
```

```
exit
```

```
path create QCDDPath-All ManagerSequence \
```

```
      MidPointModule-PrimVertex \
```

```
      JetCluModule-cone0.7PrimVertex \
```

```
      KtClusModule-PrimVertex
```

ntuples located at:

```
fluorine:/cdf/disk01/g3/jets_5.1.0
```

*Can be moved to a public place on request...*

Used version 4 of the QCD goodrun list.

List for QCD no silicon no runs excluded (0,0,0,0)

Lumi = 208.76 pb

69 runs were removed because of event count mismatches, after removing these runs we have:

Lumi = 192.67 pb

J20	772303/849942	9% fewer events
J50	232107/246869	6% fewer events
J70	100822/107857	7% fewer events
J100	128336/136952	6% fewer events

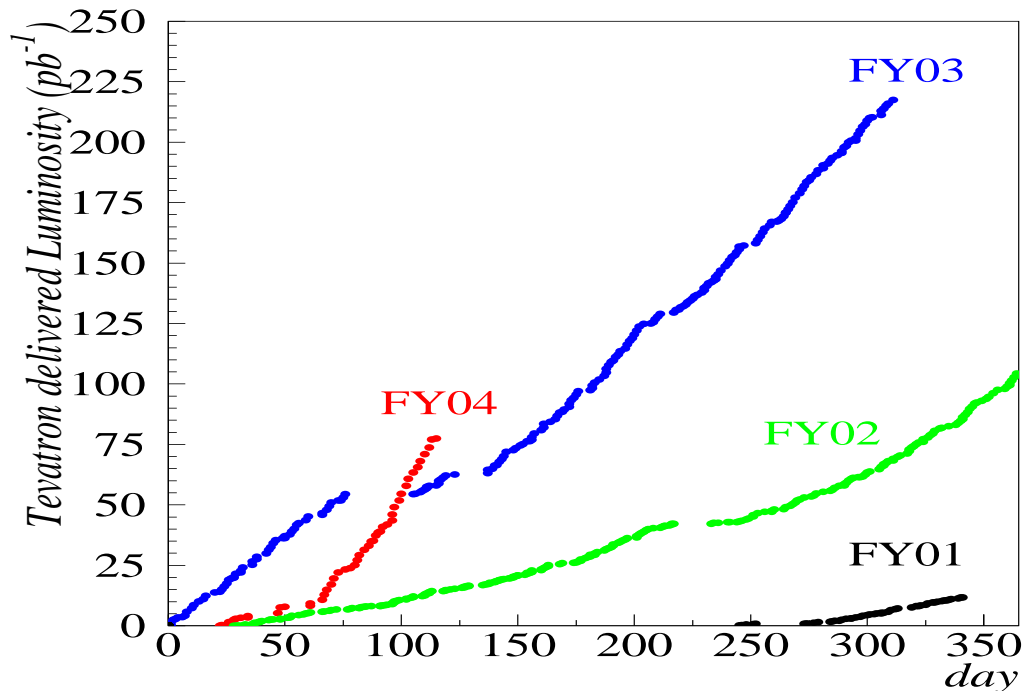
Could just scale the luminosity for the runs with missing events...

138815 (2002.02.09) *through* 168889 (2003.09.06)

Average:  $180.58 \text{ nb}^{-1}$

After run 168889 there is  $59 \text{ pb}^{-1}$  (up to Feb 23 2004)

Average:  $241.14 \text{ nb}^{-1}$

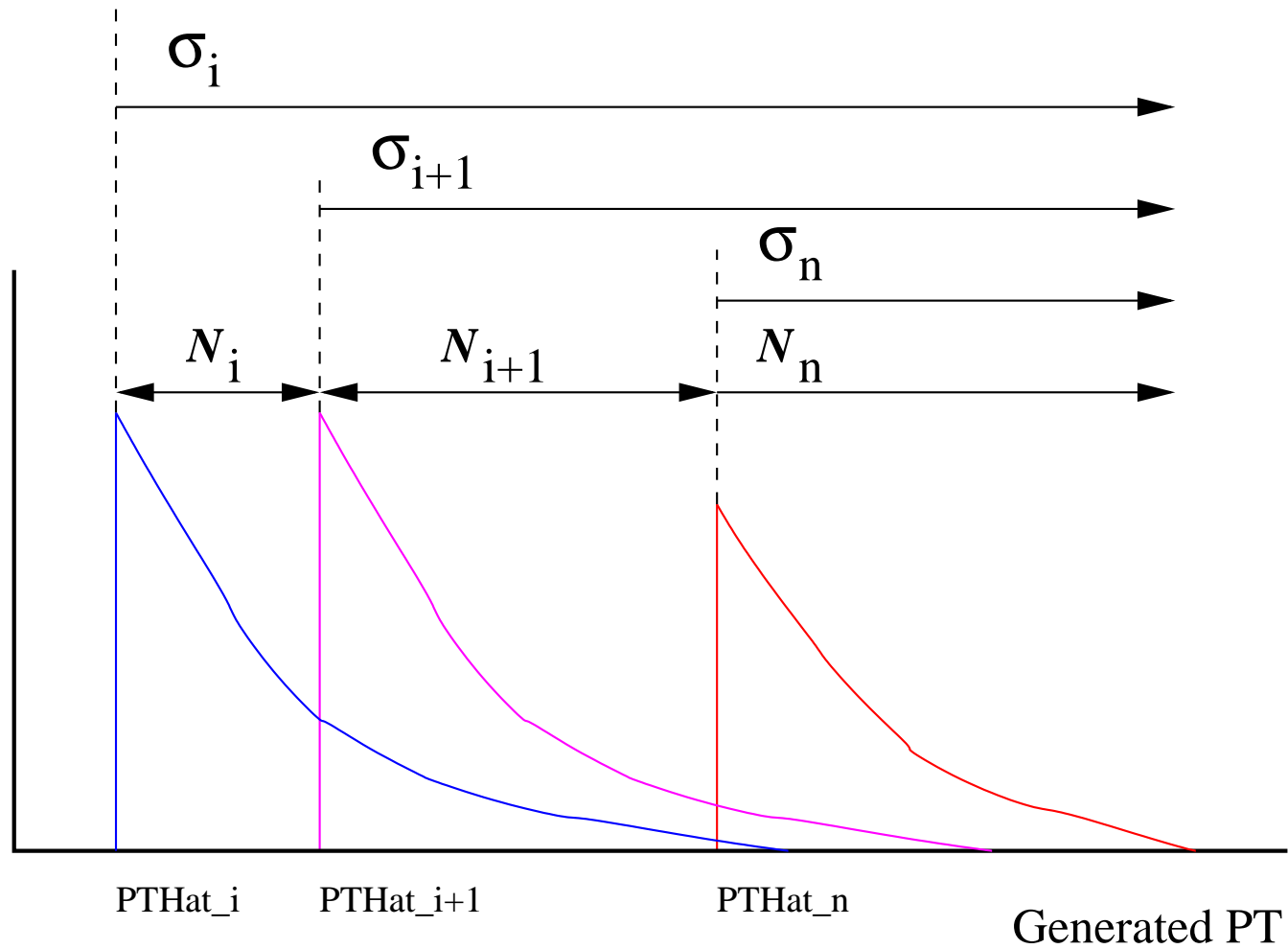


Tevatron has been performing very well

Collecting data with high efficiency (over 90%).

*Have about  $250 \text{ pb}^{-1}$  of data on tape*

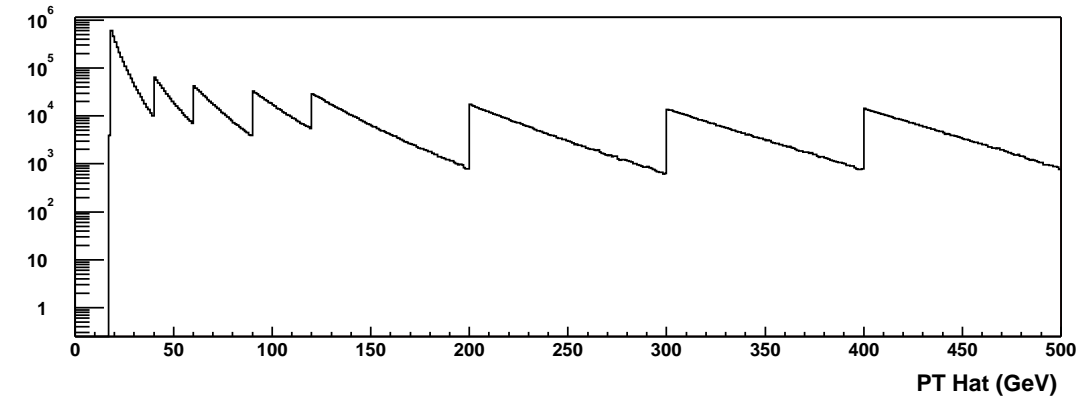
Combining the MC samples...



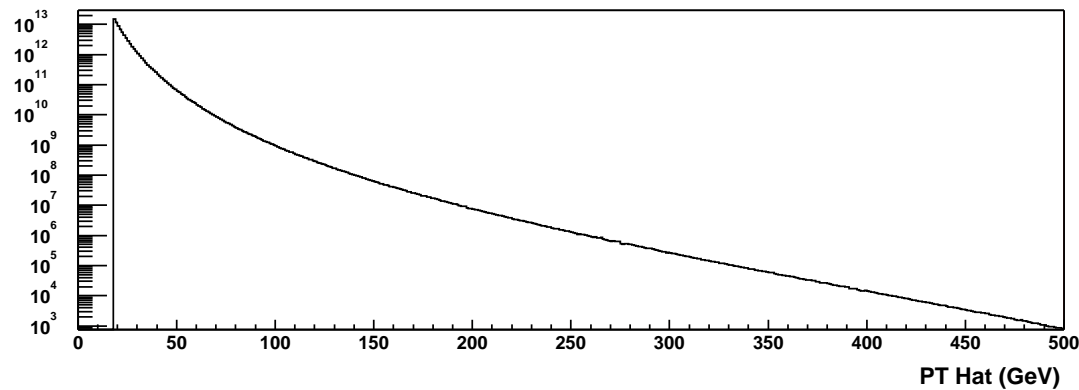
If  $PTHat$  is between  $PTHat_i$  and  $PTHat_{i+1}$

$$wt_i = (N_n/\sigma_n) \times (\sigma_i - \sigma_{i+1})/N_i$$

MC generated with 4.9.1, Pythia DiJet CTEQ5L



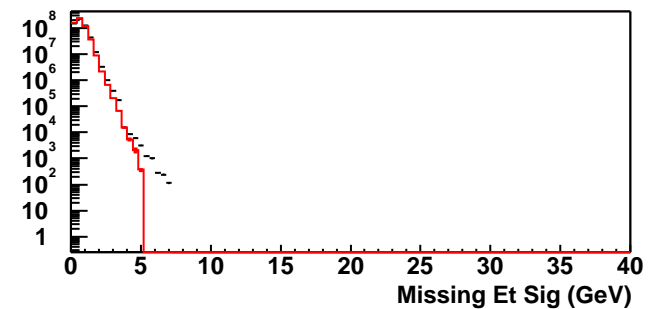
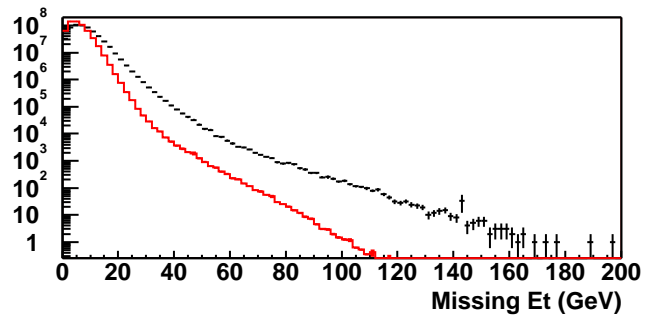
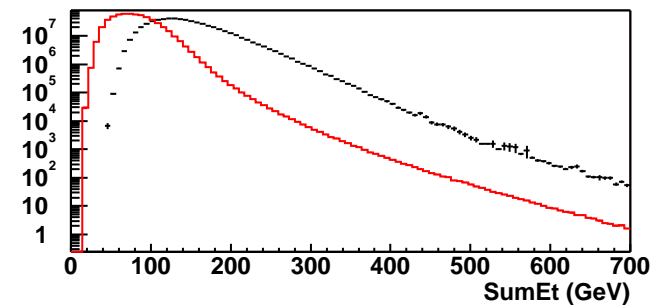
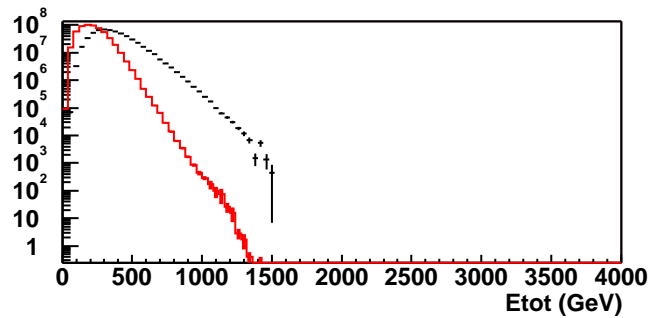
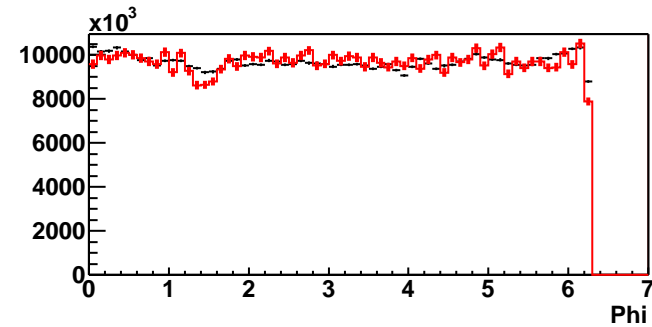
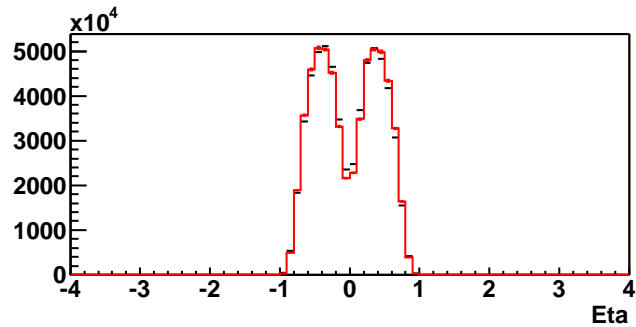
Pt Hat	Events
18	2794437
40	497497
60	462136
90	448709
120	581465
200	479477
300	447021
400	498348



MC samples combined by weighting the event based on the generated PTHat.

The result is a smooth distribution...

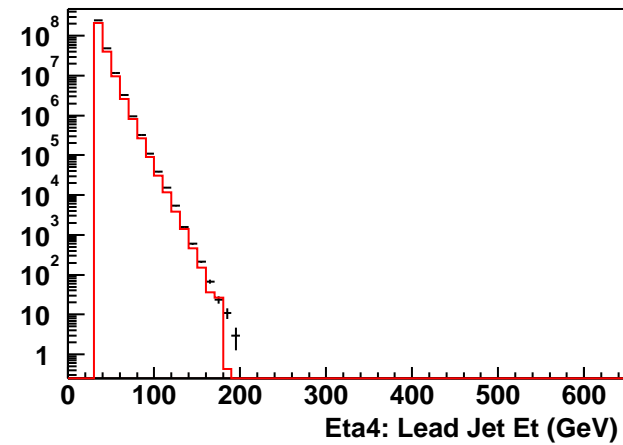
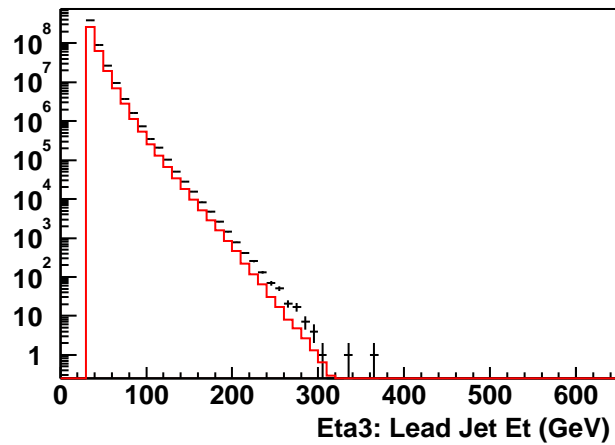
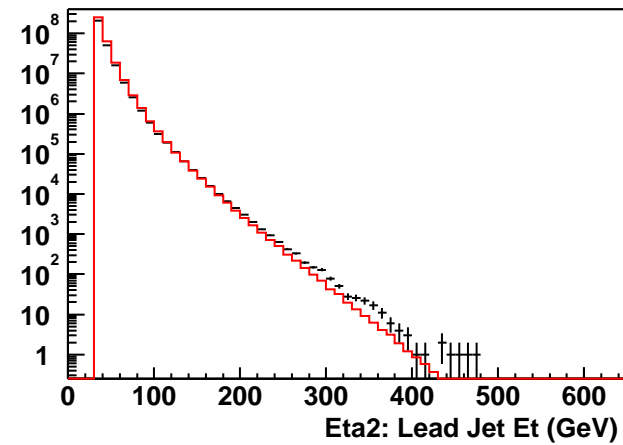
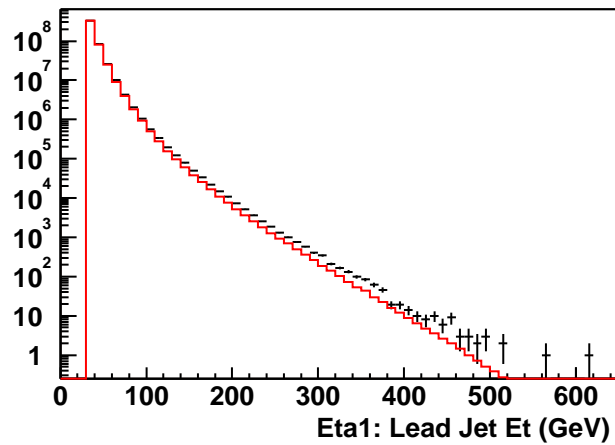
## MC/Data comparison of some global quantities



→ See large discrepancies....

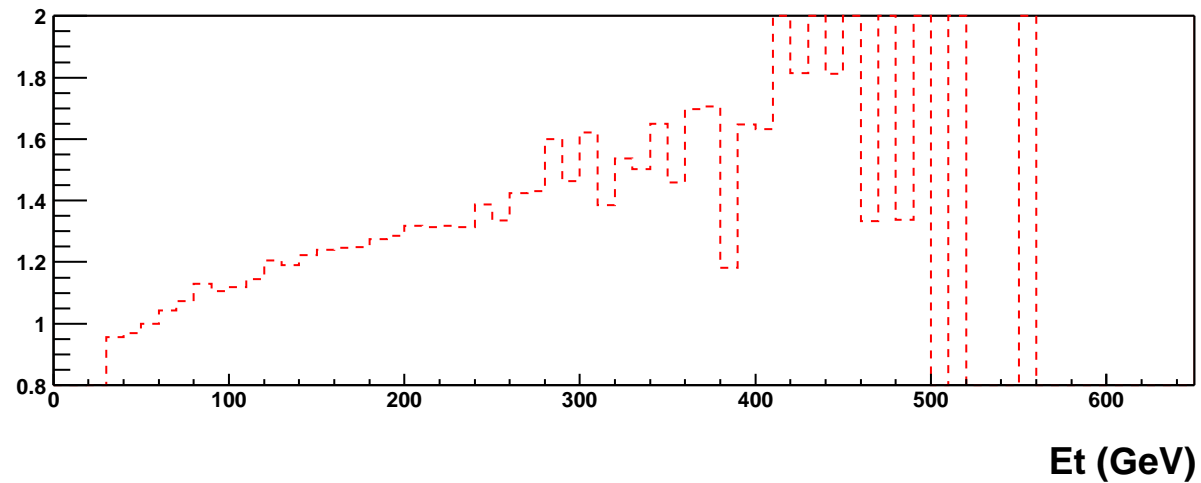
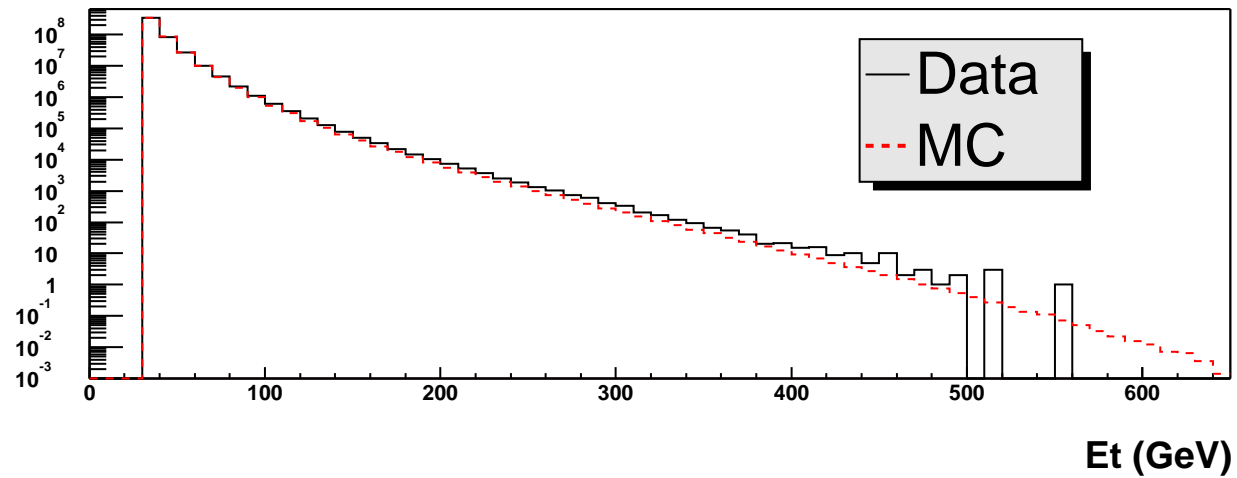
Check Cal Tower threshold, calibration version...

## Lead Jet Et in different Eta regions





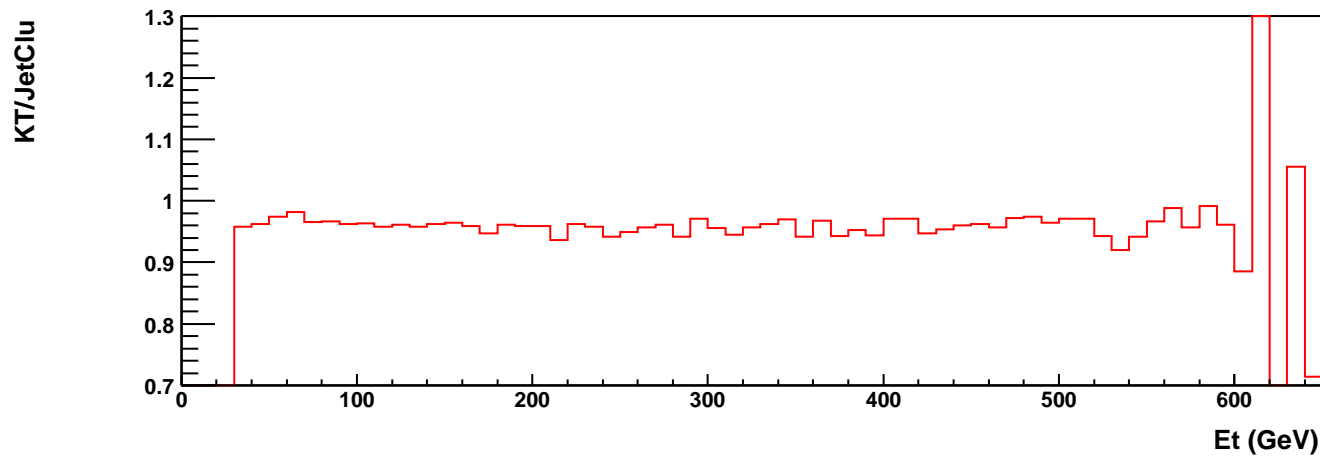
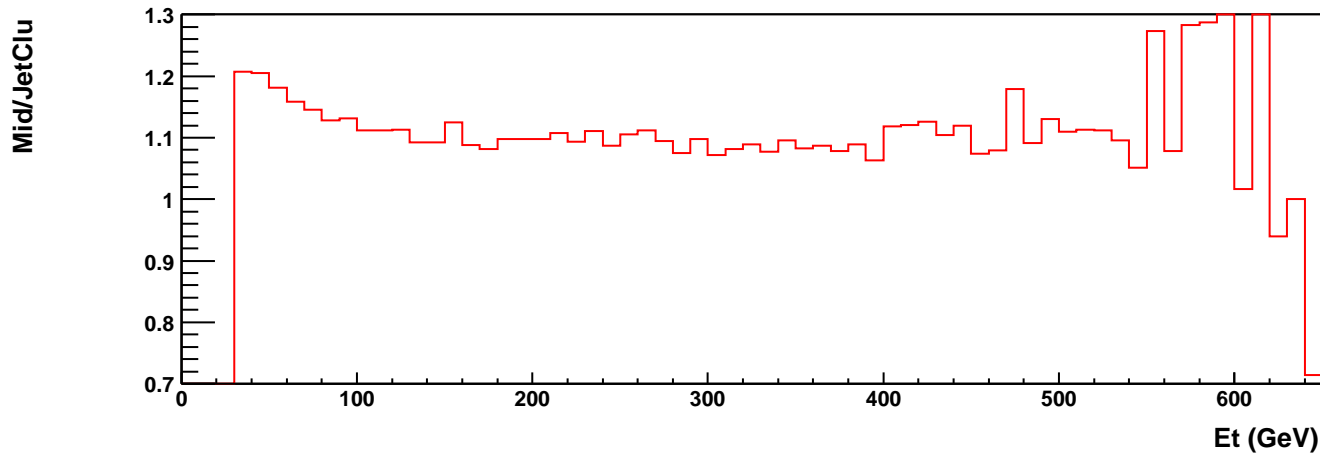
# Measured Data Compared with “Measured” MC



→ *Data rising with increasing  $E_T$*

→ *Normalization is off*

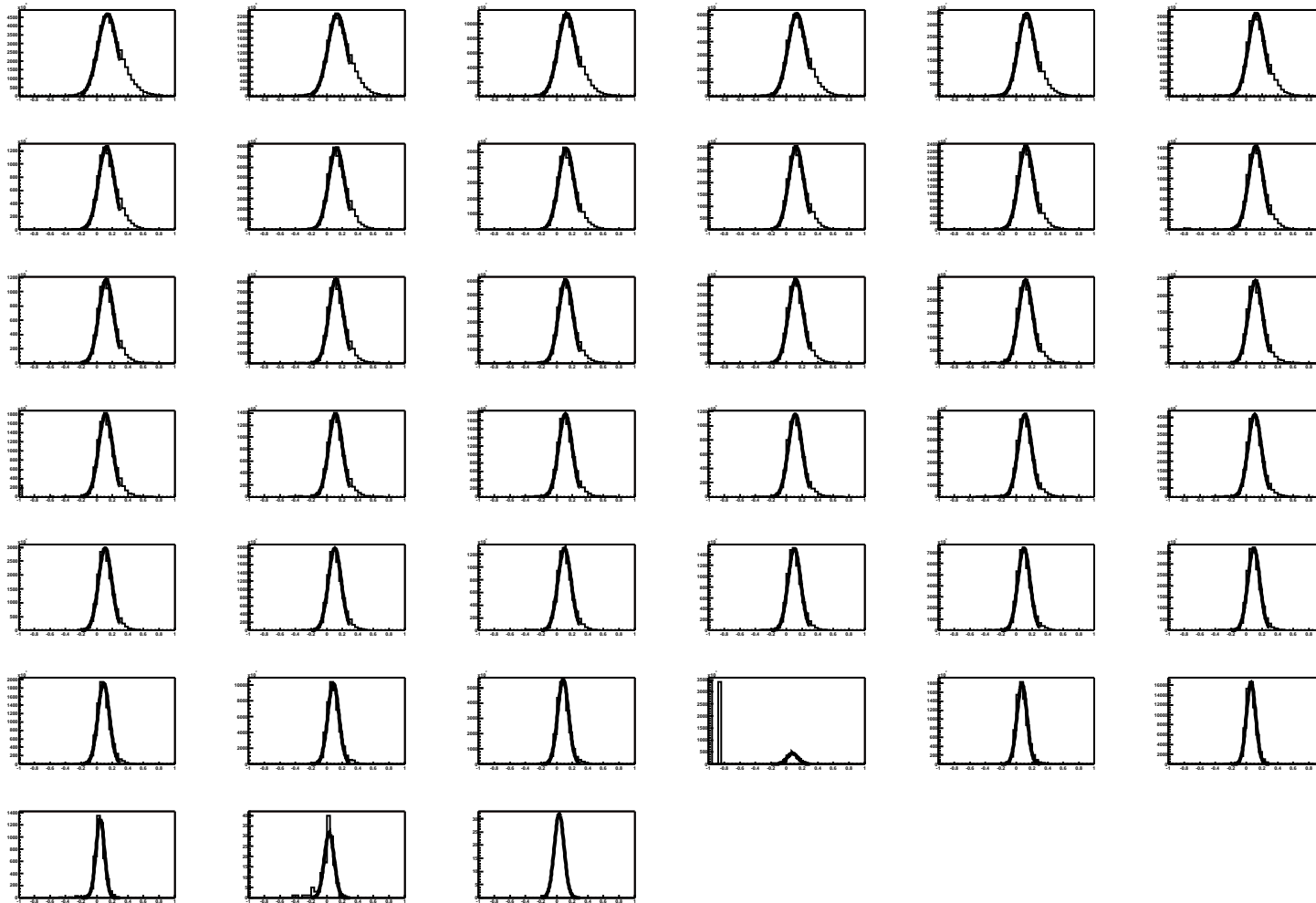
Ratio of the “measured” inclusive jet cross section for KtClus and MidPoint over JetClu.



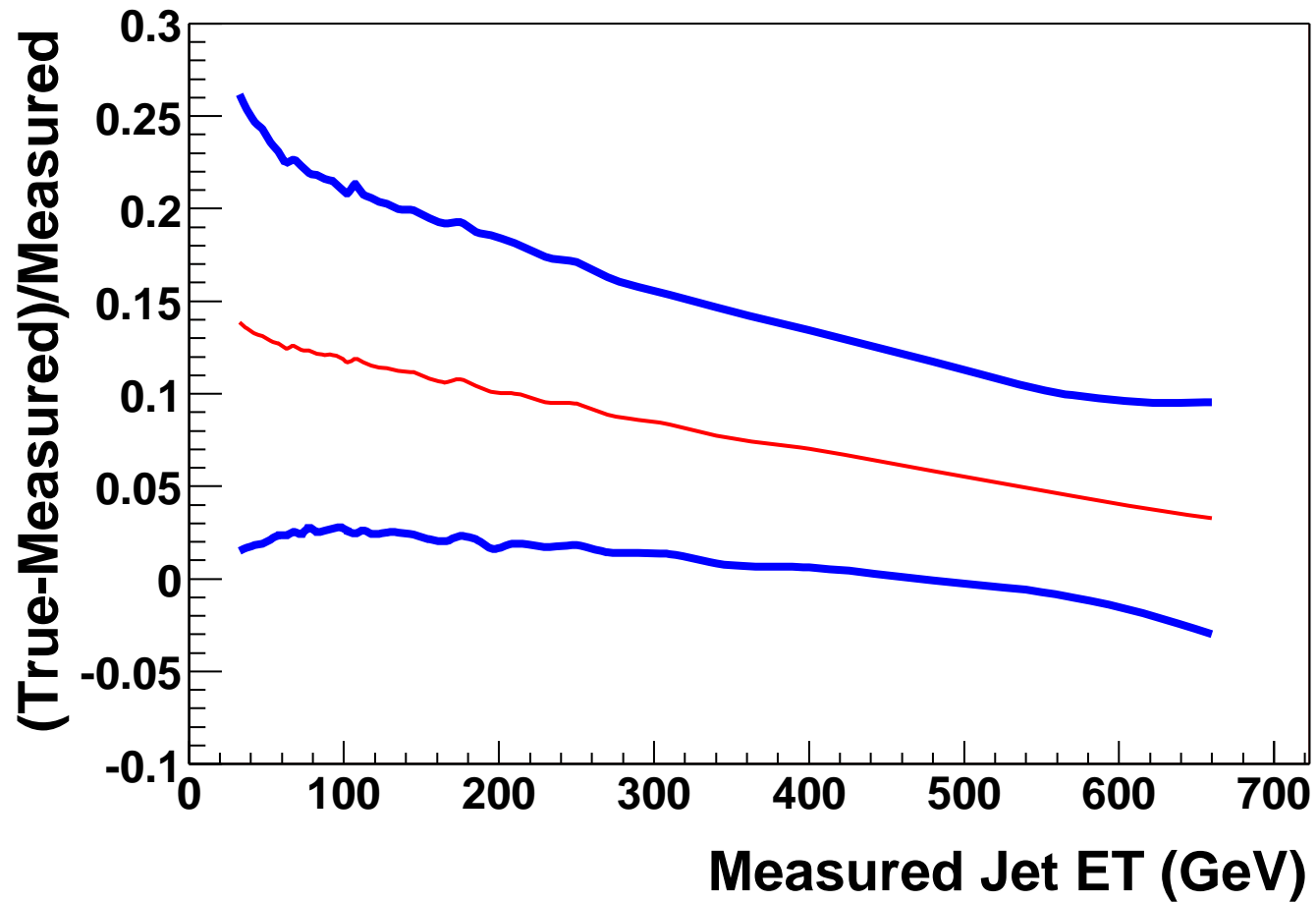
MidPoint finds more jets at lower  $E_T$ .

*Does not include bug fix to MidPoint algorithm...*

## Jet Resolutions (True-Measured)/Measured



Spike is the result of weighting the events.



Jet resolution varies from 12% at low  $E_T$  to 6% at high  $E_T$ .

The measured Jet  $E_T$  is shifted by 14% at low  $E_T$  to about 3% at high  $E_T$ .

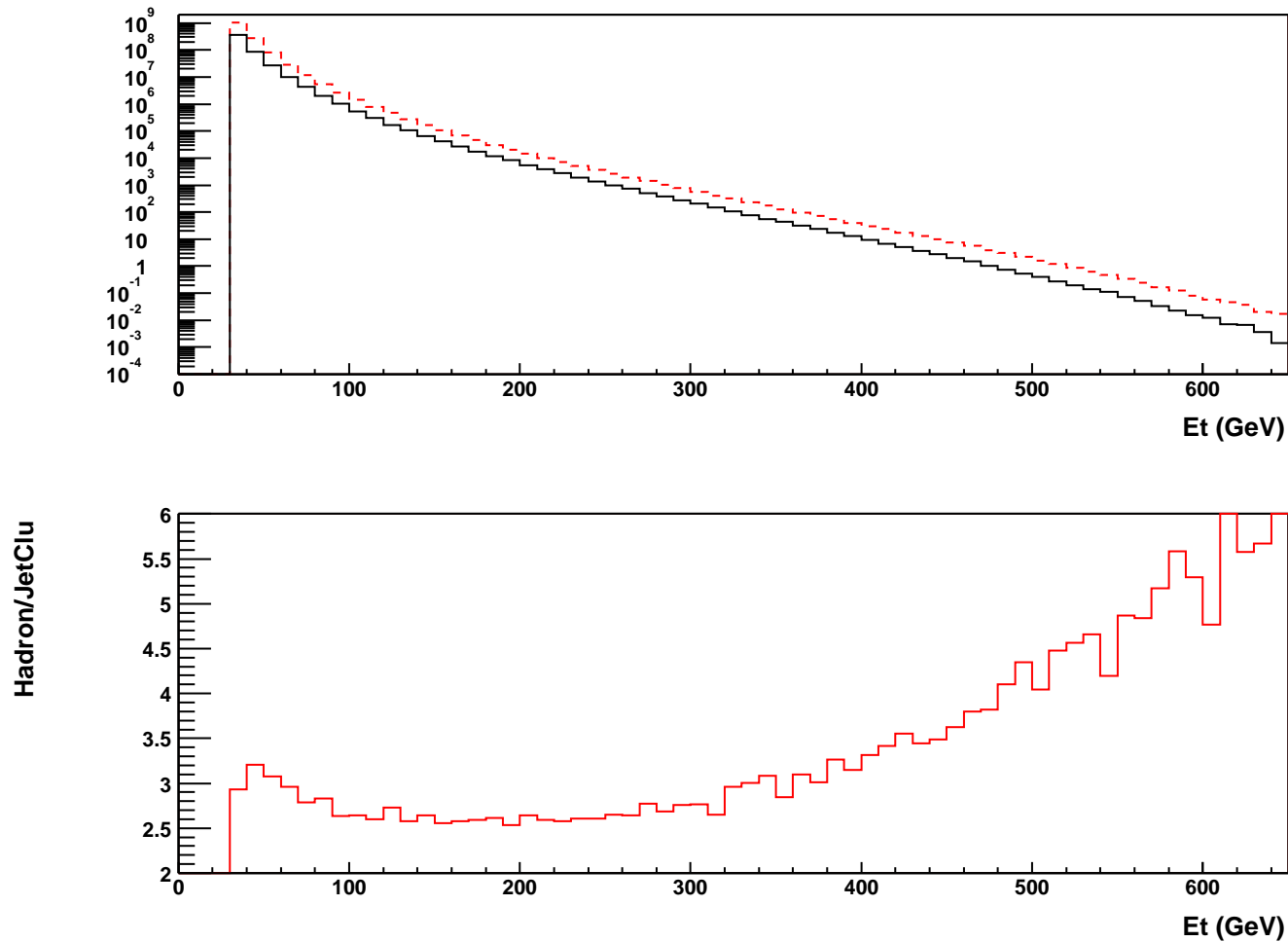
## Current Bin Widths and Resolutions

$E_T$	width	% Res	$E_T$	width	% Res	$E_T$	width	% Res
40	5	12.5	100	5	5	190	10	5.3
45	5	11.1	105	5	4.8	200	20	10
50	5	10	110	5	4.5	220	20	9.1
55	5	9.1	115	5	4.3	240	20	8.3
60	5	8.3	120	5	4.2	260	20	7.7
65	5	7.7	125	5	4	280	20	7.1
70	5	7.1	130	10	7.7	300	20	6.7
75	5	6.7	140	10	7.1	320	40	12.5
80	5	6.3	150	10	6.7	360	80	22.2
85	5	5.9	160	10	6.3	440	80	18.2
90	5	5.6	170	10	5.9	520	100	19.2
95	5	5.3	180	10	5.6	620	80	12.9

In Run I we used bins widths ranging from 4 - 22%.

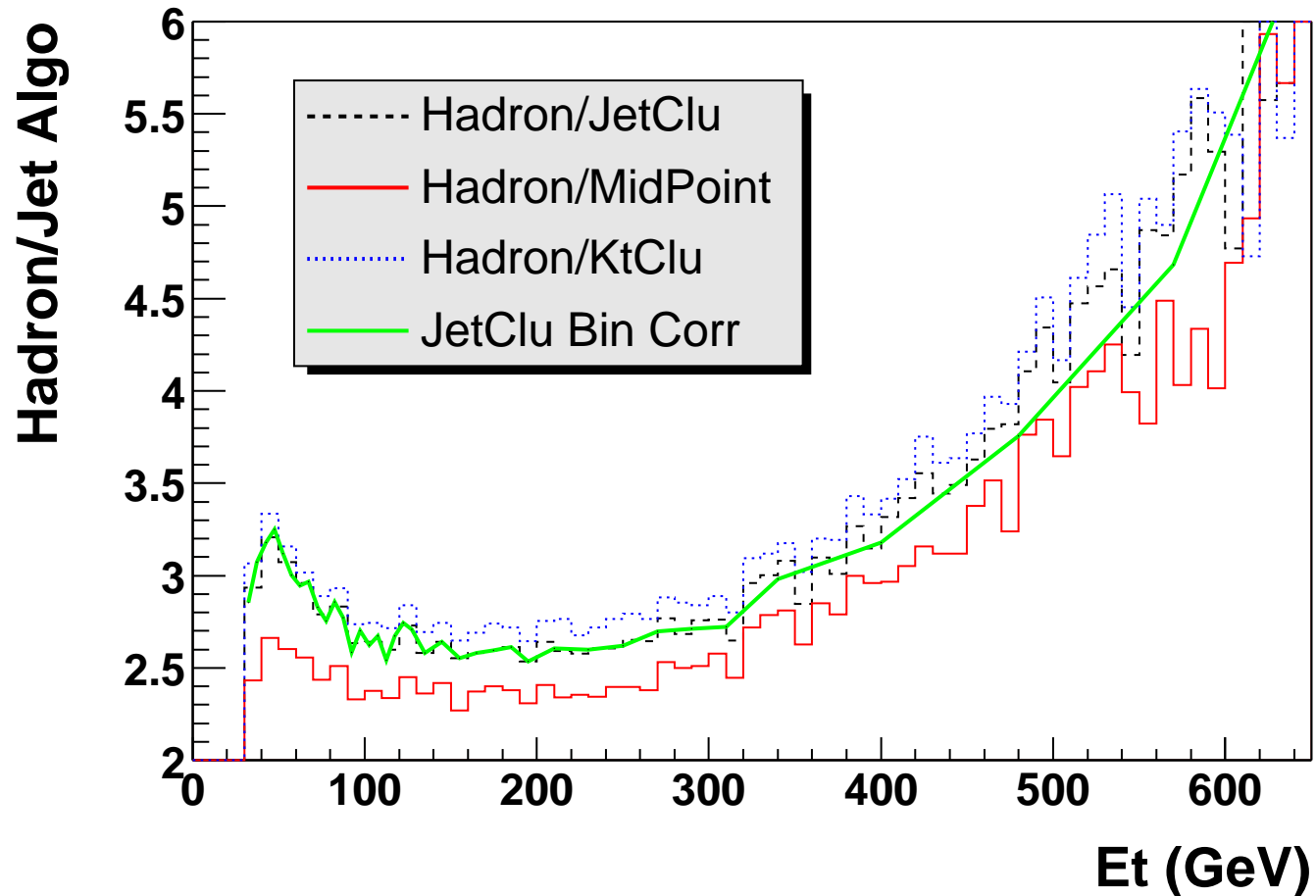
Will have to select wider bins...

Comparison of Inclusive JetClu  $E_T$  distribution with Inclusive Hardron level JetClu.



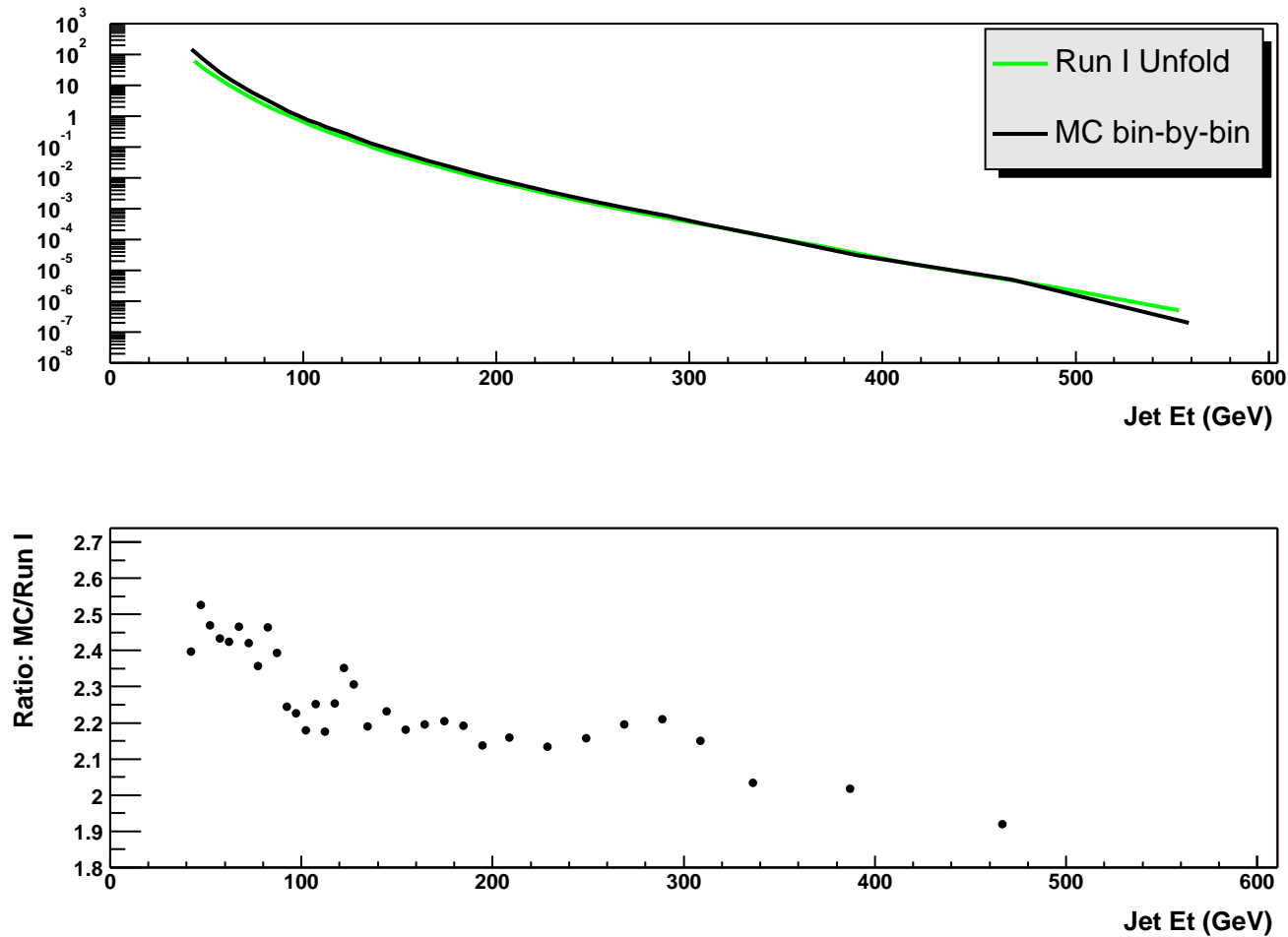
Take the ratio to get the correction factor.

Correction factor measured  $\rightarrow$  hadron level...



Larger correction at high  $E_T \rightarrow$  greater uncertainty...

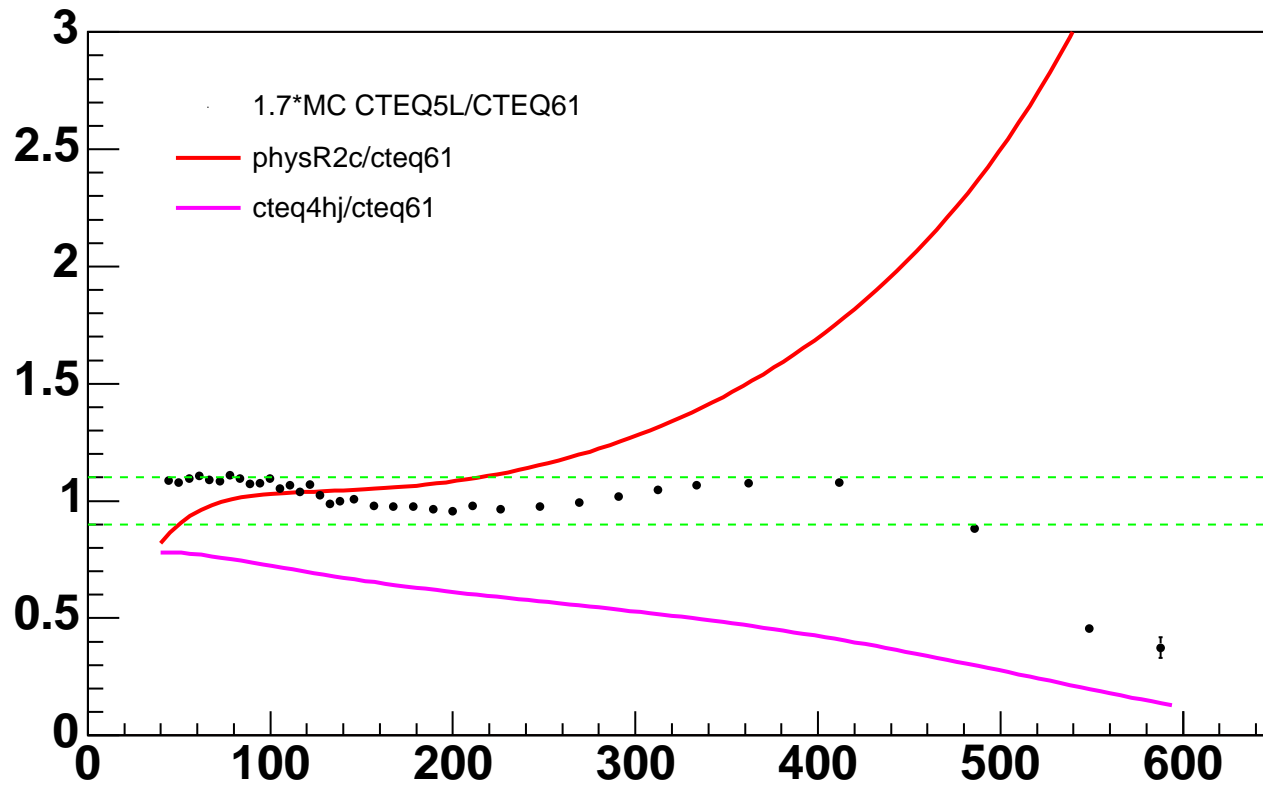
## Applied correction factor to the Data



When applying the MC correction to the measured data the low  $E_T$  region is higher than when using the Run I unfolding.



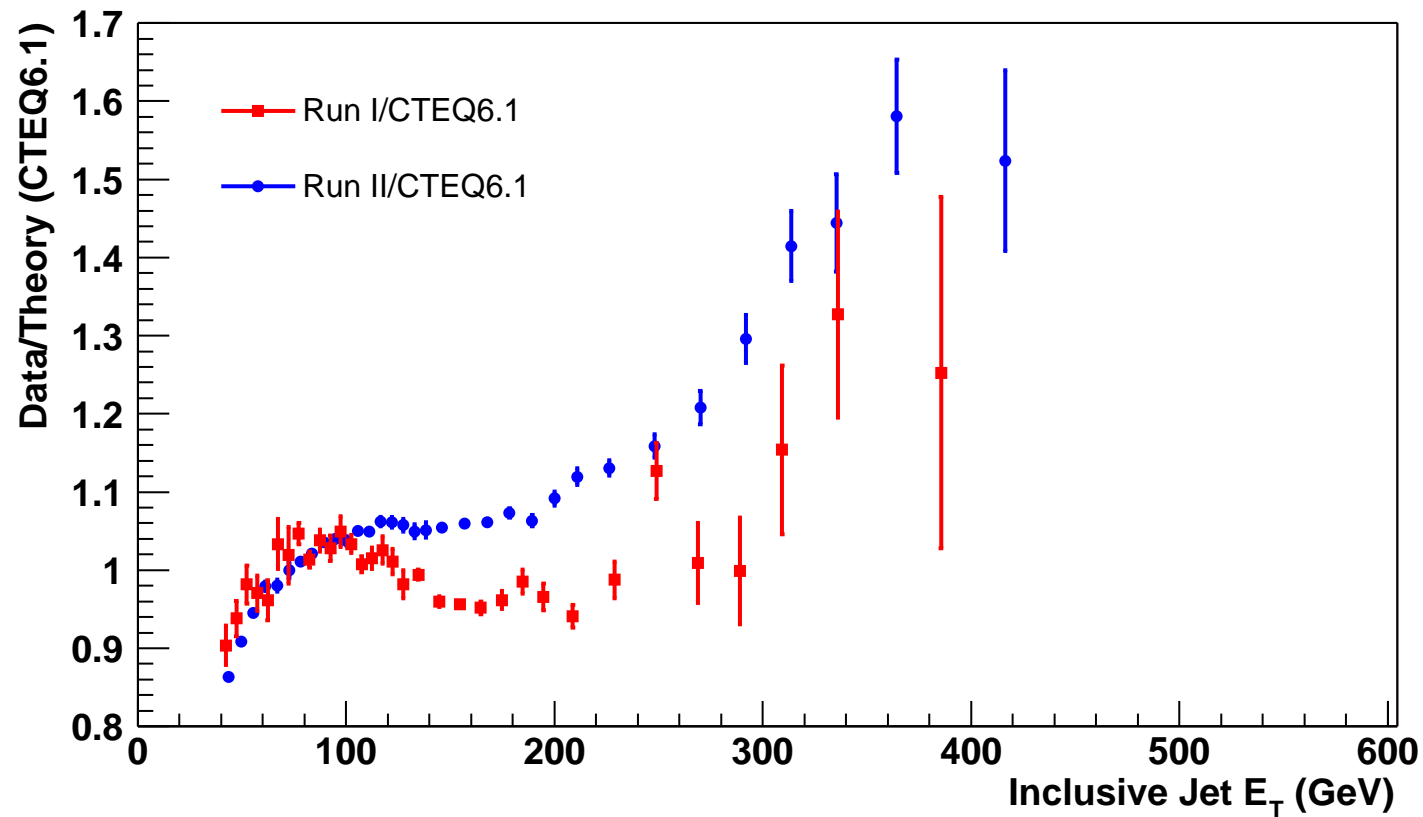
## Unsmearing the MC Using Run I Unfolding



Funny behavior at high  $E_T$

Need to compare to CTEQ5L directly...

It is too early to say... but looks like the MC correction does not result in as dramatic turn over at low  $E_T$ .



Above results are obtained using the Run I unfolding.

## Conclusions

Tevatron is performing well and we are collecting data with high efficiencies.

We had talked about a publication on the time scale of the end of the year based on the data up to the 2003 shutdown ( $208 \text{ pb}^{-1}$ ).

*May want to be more aggressive and include data up to this year's summer shutdown. Could double our data sample...*

Keep to the goal of a publication by the end of the year...

Looks like the selected  $P_T$  threshold to generate the MC works well when weighting the MC samples.

Should store PtHat in the event record (HEP4\_StorableBank)

Would like to have more up to date detector simulation, currently using version 4.9.1.

MC/Data comparisons have big discrepancies on some of the global quantities

→ Need to check calorimeter cell thresholds, calibration, etc...

There are large normalization differences between MC and data

→ Need to understand this...

Would like to have the cross section predictions for CTEQ5.1 in order to directly compare cross checks of the unfolding or generate events with more modern PDFs.

May not see a strong turn over effect at low  $E_T$  when comparing Data with MC. *Wondering if the turn over at low  $E_T$  is a feature of the unfolding...*